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ABSTRACT

A major effort to restructure the higher education system in the USSR is discussed. The reform is intended to link higher education more directly to the economy through joint research projects, work experiences for students and faculty, and industrial participation in refitting universities with technologically advanced equipment. It is also designed to improve the quality and quantity of scientific research that universities do, to tighten admissions requirements and to improve the ways students are introduced to research, and to centralize the administrative structure of the postsecondary education system. Some of the foundations of the reform are considered, including demographic changes, shifts in technology and in popular attitudes about education, and the need to enhance economic output. Attention is also directed to public discussion of the reform proposal. While newspapers and journals articles during the period between the draft and final decree generally supported the planned changes, difficulties in bringing the reform into action were noted. The long-term fate of the reform is linked to other changes now underway in Soviet society. Efforts to rethink the relationship between higher education and scientific research in the USSR and the United States are compared. Thirty-nine references are provided. (Author/SW)

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National Science Policy and Universities in the Soviet Union

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This paper was presented at the annual meeting of the Association for the Study of Higher Education held at the Sheraton Inner Harbor Hotel in Baltimore, Maryland, November 21-24, 1987. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Abstract

The USSR is currently engaged in a major effort to restructure its system of higher education. This reform is intended to link higher education more directly to the economy through joint research projects, work experiences for students and faculty, and industrial participation in refitting universities with technologically advanced equipment. It is also designed to improve the quality and quantity of scientific research that universities do, to tighten admissions requirements and improve the ways students are introduced to research, and to centralize the administrative structure of the postsecondary education system. This paper examines these developments and outlines briefly some of the wellsprings of the reform (demographic changes, shifts in technology and in popular attitudes about education, the need to enhance economic output). The paper then considers public discussion of the reform proposal: those writing in newspapers and journals during the period between the draft and final decree generally supported the planned changes, but saw difficulties in bringing the reform into action. Finally, the paper links the long-term fate of the reform to other changes now under way in Soviet society, and draws a comparative perspective between efforts to rethink the relationship between higher education and scientific research in the USSR and the USA.

National Science Policy and Universities in the Soviet Union

Introduction

The Soviet Union is currently implementing a massive reform of its higher education system. The reform was motivated by concerns for economic growth, by problems in the organization and conduct of scientific research and technological development, by structural inconsistencies in the national system of institutions of higher education, and by demographic and other social shifts. The proposed reform of higher education will, if implemented in anything like the way proposed, lead to a much closer link between higher education and the economy than is the case in any Western country and than was previously the case in the USSR itself. It will radically restructure relationships among the central government, its education ministries, the ministries and institutes that control the country's research establishment, and the firms that use the products of that research. And it will seriously affect the positions, benefits, and opportunities available to Soviet scientists and faculty members at these institutions.

Our task here, then, will be first to characterize the reform as it was finalized in March, 1987. We will then briefly examine the wellsprings and timing of the reform--the underlying economic and social problems that made the reform necessary in the eyes of Soviet leaders. We will also briefly summarize public discussion of the reform in the Soviet press. Finally, we will consider what the future may hold for this reform effort, and we will examine it in a comparative perspective of current concerns about the role higher education plays in scientific research and development in the United States.

Basic Features of the Higher Education Reform of 1986-87

The final version of the reform document, entitled "Basic Directions for the Restructuring of Higher and Specialized Secondary Education in the Country," includes ten sections: an introduction that lays out the problems; a call for closer integration of education, science, and the economy; and then a series of sections outlining each of the substantive issues to be dealt with--improving the quality of education in fundamental and applied fields, strengthening scientific activity in higher education, re-equipping institutions of higher education with the latest technology, providing for a network of continuing education courses, improving the preparation of faculty, improving higher educational administration, and raising the level of ideological awareness of students. (For the draft document, see Proekt TsK, 1986; the final version is V TsK KPSS, 1987; for some major commentaries and editorial discussions, see Na putiakh, 1986; Vremia, 1986; V nogu, 1986; Ot zamyslov, 1986). We will focus our discussion here on those aspects of the reform that most directly reflect changes in national science policy.

The integration of education, production, and science. The reform document makes it quite clear that the basic intent is to improve the functioning of the national economy. Proposed here are new types of relationships among universities, institutes, branches of academies, and industrial firms and combines. These new units--referred to as "instructional-scientific-production complexes"--would have particular responsibility for training specialists for one or more branches of industry, for assuring their continuing education "over the entire course of their productive careers," and for doing research and carrying the results directly into production. Faculty and students would do intensive internships in industry, and specialists from industry should become guest-

lecturers and special faculty in universities and institutes. The industrial firms and their supervising ministries would have partial responsibility for assuring that universities and institutes were provided with material resources to carry out these tasks. New legal and administrative arrangements would be worked out to make it easier for firms and universities to engage in this sort of activity.

One intent of these changes is to permit more rational planning for admission of students to higher education and "distribution" of graduates to industry. In the Soviet Union's centrally planned economy, industrial enterprises have traditionally submitted plans and projections to branch ministries, which then determine the number of student places that will be open in, say, a particular field of engineering. The system has not worked well, and the document notes that the demand for engineers has typically been overestimated, resulting in a serious oversupply of specialists with very narrow training.

Universities are also to be more concerned with the quality of preparation their graduates receive. A proposed solution has graduates receiving a diploma immediately after graduation, but not obtaining certification in their specialty until they have demonstrated proficiency and professional growth during the three years of required work at an assigned location. Periodic reevaluation would also be required.

Improving the preparation of qualified specialists. What is foreseen here is both a reduction in quantity and an improvement in quality of personnel trained by institutions of higher education. Universities must reduce the number of graduates in certain fields where an oversupply exists, they must reevaluate degree programs that are too narrowly specialized and must seek to establish programs that would educate broadly trained specialists, and they must be both more selective in granting admission and

more strict in culling students who lack initiative or talent. Administrators are to use evaluation approaches developed in psychology and education to accomplish these ends.

To raise the quality of education, universities must find ways to increase the amount of time students spend in independent study and seminars, and reduce the number of required hours in lectures. Special efforts are needed to identify those students who have a proclivity for scientific and technical work, and plans for their individualized education must be prepared. Additionally, linking higher education and industry will require that specialists from industrial firms be attracted to teaching in universities.

The importance of improving scientific work in universities. The reform calls for the tighter integration of scientific activity among universities, research institutes of the Academy of Sciences, and industry. The absolute amount of basic research work carried out at universities is to be increased two to three times, and the amount of technical design and experimental work three to four times, by the year 2000. Budget increases for these changes are to come partly from governmental sources, but partly from contracts for development work that universities will make with industry. Up to 20% of the budgeted cost of such contracted work may be collected in a special fund by the university to help defray the overall expense of building up research potential.

Pushing the results of this research into practice will require improvement of the research base of universities; special inter-university organizations and enterprises will need to be established, and the various ministries are expected to participate in this effort.

Technological refitting of higher education. In addition to the curricular and personnel changes described above, the reform also calls for

a significant infusion of new technology and other resources into the country's higher education system. The interesting aspect of this is that firms and branch ministries are called upon to contribute to this effort, by providing financing, by offering students and faculty access to the latest equipment, and by supplying to universities the first regular production examples of new technology as they come off the assembly lines.

The reform document also incorporates some quite specific construction proposals (e.g., 18 million square meters of new laboratory space). Universities are also to infuse significant quantities of new computer technology: 130,000 new terminals are to be added (the intent is to be able to guarantee every student 200 hours--engineering students will get 500--of terminal time during a degree program). It is anticipated that the use of inter-university databanks and electronic communication networks will expand significantly.

Improving the quality of faculty. In this section, the reform document proposes some far-reaching changes in the ways faculty for higher education are to be trained, selected, and evaluated. The ways graduate students are selected are to be improved, their stipends are to be raised, and dissertations are to be focused on "priority problems in science and technology." Programs leading to the doctorate (not previously offered via defined course work in the USSR) are to be established at the leading universities.

Faculty currently at work will have the option of taking leaves of up to a year to work in industry. The Ministry of Higher and Specialized Secondary Education is to be granted the sole right to determine how faculty ranks and titles are to be distributed.

In one of the most surprising aspects of the reform document, administrators and faculty are to be subject to periodic reevaluation, and

university rectors are to have "the right where necessary to establish an annual probationary period before faculty are selected competitively." This is seen as necessary to help university faculty members develop a high sense of discipline, initiative, and to fight against instances of "routinism and protectionism."

Improving the administration of higher education. The reform document is quite specific about a number of changes needed to assure that its various elements are properly implemented. One change called for is an increase in centralized control over the system of higher education, a suggestion that may sound strange to Westerners accustomed to thinking of the Soviet Union as a highly centralized society. While this is generally true, in the case of higher education the system has been one of multiple rather than single centralism: while most universities answer to the Ministry of Higher and Specialized Secondary Education, many institutes have in the past answered mainly to their branch ministries in the economy--the Railway Ministry, for example, was primarily responsible for the training of its own specialists through its Institute of Railway Engineering. This situation, with its enormous attendant confusions and inefficiencies, is now to change, and the Ministry of Higher and Specialized Secondary Education will have more overall control.

Carrying out this change will require the establishment of regional higher education centers, incorporating special units to oversee curricular and instructional plans in the context of local needs. These centers will be based at leading universities of the region, and will unite institutions offering preparation in related fields. The Ministry will also have increased powers to evaluate universities and institutes, and to coordinate the employment of faculty and administrators, irrespective of their institutional affiliation.

Universities and institutes are also to gain new powers to define some portion of the curriculum for themselves, to enter into legal contracts with firms, and to deal internally with matters of faculty evaluation. The role that faculty may take in institutional governance is not neglected; their influence is to increase commensurately with their new responsibilities, but they are called upon to become more actively involved in all aspects of the process of restructuring.

Wellsprings of Reform: Soviet Society and Higher Education in the 1980s

It is important to bear in mind that this reform of higher education in the USSR is only one of a number of changes under way at present to fundamentally restructure the Soviet economy, the society, and the habits and patterns of mental life of Soviet citizens.

Soviet society in the late 1970s and early 1980s faced a number of competing and contradictory demands: government officials looked for quantitative increases in production and economic growth, while consumers hoped for improvements in the quality of production; some technocrats hoped to catch up with Western technological developments by any means necessary (including purchase of Western goods), while others looked for a native capacity to create technological goods and services; planners sought better human resources planning to assure economic growth, while students and parents demanded more access to higher education. There was also a continuing tension between, on the one hand, a governmental and popular assumption that centralized control can work beneficially for society, and on the other, the desire of bureaucrats in the research-development-education establishment to maintain the status quo in a system that had become progressively more insular and diffusely controlled. While debate on these issues proceeded more or less openly, several less visible structural

problems contributing to the reform program bear brief mention here.

Strains on the economy and access to higher education. Soviet economists and social planners face a severe dilemma: the economy demands workers who are skilled (but who do not require training at the postsecondary level), while great numbers of secondary school graduates want to obtain a higher education almost at any cost. Birth rates in the highly industrialized European parts of the USSR have declined both absolutely and relative to those in the southern and Central Asian parts of the nation, leading to a shortage of workers where they are most needed and to a superfluity of workers whose command of Russian may be minimal, who are relatively poorly educated, and who may resist moving to take jobs elsewhere.

Changes in the Soviet economy include a move away from older ("extensive") industrial patterns, featuring mass application of largely unskilled labor, and toward a more "intensive" pattern, in which specialized skill and the ability to participate in various parts of the process of production become more important. These shifts led to elementary and secondary education reforms in the early 1980s intended to steer more students into professional-technical schools (PTUs) and away from higher education, an effort that has been only partially successful to date (see Balzer, 1987; Dunstan, 1985; Kerr, 1982, 1987; Kuebart, 1986; Szekely, 1985, 1986).

Prestige and attractiveness of higher education. While economic factors probably were central in Soviet planners' decisions regarding the reform of higher education, there was doubtless also concern over problems associated with the prestige attached to involvement in higher education. These problems were two-fold, and together they offered a glimpse into the sometimes paradoxical nature of Soviet reality. On the one hand, higher

education throughout the 1960s and 1970s enjoyed considerable prestige among young people and their parents; on the other, declines in the wage advantage of educated specialists (due partly to factory managers' need to attract manual laborers by paying higher wages) during the 1970s made higher education a progressively less attractive career option for both students and faculty.

Control of higher education and the mandates of economic reform. The USSR has had a system of higher education that, for a centrally administered country, is surprisingly parochial in its organization and links to the national economy. While such a description may sound paradoxical to Western ears, it has nonetheless been quite appropriate: Soviet universities are subject to the direction of the Ministry of Higher and Specialized Secondary Education, but institutes that prepare specialists to work in various branches of the economy are governed by the various branch ministries (of which there are more than 60). Additionally, much research work is carried out at the various institutes and affiliates of the USSR Academy of Sciences, the separate Academies in the 15 Soviet republics, and by separate academies in such areas as medicine, education, and agriculture. And, as is the case in most advanced economies, many large industrial firms maintain their own research and development staffs. Coordination among these various operations has been loose at best, and in many cases non-existent.

In the past, most Soviet research and development work has been carried out by the research institutes, or under very specific contracts negotiated with universities. Relatively little research has been conducted independently by universities, and the kinds of continuing relationships that exist in the USA between large firms and major research universities are practically non-existent. Soviet universities have seen their role as one of providing trained specialists.

The implications of this separation of functions and lack of centralized control are several. Clearly, there have been problems in assuring comparable levels of quality in the preparation of students in specialized fields, especially in engineering and scientific disciplines. There have also been significant problems in determining the needs of the economy for trained specialists in any given field. Perhaps more importantly for the Soviet economy, there have been numerous cases of overlapping responsibility and overlapping R & D work, together with actual disincentives in many cases for university departments to work collaboratively with industry. The result of these pressures has been a system of higher education remarkably decentralized and uncoordinated both internally and in its linkages with the national economy.

The reform effort is clearly designed to deal with these problems by increasing the amount of control allowed to the Ministry of Higher and Specialized Secondary Education, by removing certain of the barriers to collaborative activity that have prevented the universities and institutes from working together, and by providing pressure for industry to share resources more equitably with the institutions of higher education that provide personnel to industry.

Public Discussion of the Reform: The Soviet Academy Speaks

As with many other documents of this kind, the draft reform document published in June, 1986, was clearly intended to stimulate public discussion about the proposed changes and to make all those concerned (faculty members, administrators, those in institutes and academies, and those employed in industrial R & D) aware of the proposals. What followed between last June and March of this year was a period of fairly intense "debate" in the Soviet press about the reform and the changes it involved.

Such discussion periods do serve an important purpose in the Soviet

policy formation system. They allow elaboration of the proposals to be made in a public forum, with some participation from the various groups in the society that the change will affect. They permit the regime to gather indirectly a sampling of concerned opinion about the changes. And they provide an aura of concern and interest in popular expressions around the topic in question (Dzirkals et al., 1982; Hough & Fainsod, 1979).

The discussion of the higher education reform was quite intense; in the two months following the initial publication of the document, more than 250 articles appeared in Soviet newspapers (figures from Letopis', 1986). Other materials have appeared more slowly in the periodical press, and especially in Vestnik vysshei shkoly [Courier of Higher Education], the main Soviet journal on higher education. While nothing distinctly contradictory appears in the public discussion, the materials do offer some insights into the feelings of Soviet students and academics about the reform, and provide further illustrations of the problems with which the reform is intended to deal.

We will survey here the discussion and proposals advanced in five major areas: (1) enhancing the relationship between higher education and the economy; (2) improving the selection and direction of students; (3) changing how faculty members are evaluated and rewarded; (4) improving the administration of postsecondary education; and (5) raising the quality of instruction.

The relationship between higher education and the economy. Most of the materials that appeared between the publication of the draft and final versions of the reform strongly supported this basic aim. Yet there were a number of complaints and suggestions voiced even here. These dealt with the legal and organizational barriers to setting up the proposed "scientific-instructional production centers" (Zaitsev & Tovologin, 1986). Two who

tried to work out such an arrangement, the director of a large factory and a professor at an institute for mechanical engineers, spoke somewhat bitterly about the pressures and difficulties they faced--lack of authority to take action, lack of appropriate planning models, difficulty in locating good students, equipment shortages, and pressure from various sides to "crank out" quickly specialists of a new kind (Saltykov, 1986). The fears of managers about participating in such ventures were also the subject of commentary by the rector of the Latvian State University (Miller, 1986). And the Minister of Higher Education for the Russian Republic, in describing two "experiments" in joint industry-university work, admitted that each was still based primarily either in industry or in higher education, not in a truly joint undertaking (Obraztsov, 1986).

The rector of the Moscow Aviation Technology Institute spelled out concretely some of the conditions that would need to change for the vision of closer education-production linkages to become a reality. Higher education institutions should have the right to make multi-year contracts with specific branches of industry to take 30 to 40% of their graduates; the existing limitation on the percentage of faculty at a university or institute who are simultaneously employed in industry should be raised from 2% to 6%, and their working conditions should be such that they are not penalized for work-related absences (as they are at present); and legal arrangements between factories and postsecondary institutions much be made both easier and more flexible (Mitin, 1986).

Students and graduates: Selection, evaluation, direction. It is interesting that perhaps the most impassioned rhetoric about the reform came in response to the proposals for changes in the way students are selected, evaluated, and then put to work in the national economy. With regard to admissions, some administrators suggested that they could do a better job if

they were permitted, for example, to admit 5 to 7% more students than they were currently allowed to, with the understanding that these would be winnowed out at the end of the first year (an idea hitherto heretical in the Soviet context; Sirazhdinov, 1986).

In addition to reducing the student-faculty ratio, the reform provides for more independent work for students--a revolutionary idea in the Soviet context. The rector of the Moscow Engineering-Physics Institute, in a debate with a student on this issue, expressed what may the opinion of many Soviet faculty: independent work is fine, but only when confined to the final stages of a student's work; lectures and directed study are needed at the start (Shal'nov, 1986).

There was sharp criticism of the muddled way in which branch ministries set quotas for student admissions in various fields, and then apparently fail to use those graduates effectively. Every second specialist with a higher education diploma now works in a job not requiring that specialty, a factor that has lessened the prestige of the specialist and also served to shift the specialist-technician ratio decidedly in favor of the specialist (Kadry, 1986).

Specialization comes in for many critical comments in the published discussion. There is clearly a good deal of support for the attempt to revise higher education so that graduates could shift fields more easily. "Overspecialized" graduates tend to go where the pay is best (presumably to industry with military and technological ties), leaving light industry with serious shortages, and the specialized professional journals are filled with "endless graphs, unreliable formulae, descriptions of narrowly applicable processes, etc." (Soliankin, 1986). Some blamed the education system for doling out knowledge to students in "precise portions, quantified on the 18th century principle of the division of sciences..., instead of the mutual

interpenetration of sciences characteristic of the 20th century" (Alekseeva, 1986).

Faculty: Remuneration and evaluation. Among the parts of the reform most directly affecting faculty were the dual carrot-and-stick proposals regarding pay increases and evaluation. The head of a section of the Economics Department at Moscow State University presented an interesting analysis of the issue of faculty pay: salaries in higher education are low, he said, but they are also not equitably distributed. Increases should be earned and not simply expected. Rather than simply have the government provide more money to universities for distribution to faculty, he suggested, why not garner the money from consulting work with industry, or from contracts that institutions would make with particular factories or branches of industry to prepare specialists with a unique set of qualifications. Total faculty salary could be comprised of the base, plus one-half that amount as a reward for the value of the work performed, plus pay for work performed on contract, plus an end-of-year bonus (Egiazarian, 1986).

Centralizing the administration of higher education while enhancing local autonomy. The proposal to clarify the curricular authority of the Ministry of Higher and Specialized Secondary Education and to involve faculty more directly in university governance drew mixed reactions. Clearly rectors and deans do not enjoy the current confusion stemming from multiple sources of authority.

Several administrators discussed the problem of institutional self-aggrandizement and self-perpetuation. All rectors try to keep their institutes growing, complained one (Samyi [Shubkin], 1986). Regional pressures to maintain "our own" institute often interfere with efforts to combine smaller and less efficient teacher training institutes into larger

operations, even when that would be more effective (Besbaev, 1986).

The reform also suggests strongly that faculty should take a more active role in governing the internal life of their institutions and share in the responsibility for making curricular decisions and for overseeing improvement efforts. In at least one dramatic case of "democratization," this led to a university-wide election of a new rector, with two candidates in the running. The Soviet report of the event is rich with the anguished flavor of a faculty finally coming to grips with the agonies of self-governance (Popov, 1987).

Improving instruction. The use of computers in higher education, as one might imagine, was a topic of considerable interest. Some enthusiasts spoke out early, suggesting that wider use across disciplines was desirable, and decrying the "passivity and modesty" with which many approached the task of learning about and with the new technology. There was more than a hint of condescension in one comment that student and faculty fears were excited by the "culture of thought and exactitude in activity" that computers demand (Perevalov, 1986).

But while there was much enthusiasm, there were also notes of caution. Two academics argued in different ways that what was needed was not an across-the-board "computerization," but rather a careful examination of where and why computers should be used. Study of computer principles makes sense, they argued, when students have a reason for solving problems with the aid of a computer, and when faculty can obtain the needed training in a more-than-purely-formal way (Filippov, 1986; Chuian, 1986).

Conclusion: What Likelihood for Success?

Any attempt to determine the potential for success or failure of the ambitious program for reform of the Soviet higher education system must be

grounded realistically in an understanding of how Soviet society operates, what the forces militating for and against the change are, and what their stakes are in the process. We will conclude by providing first a few general observations about the way contemporary Soviet society handles proposals for change, then turn to an examination of the specifics of the situation in postsecondary education, and finally consider the Soviet reform in a comparative context of concerns about the relations between universities and national science policy.

Some givens: Soviet society and social change. Casual Western observers sometimes think of social life in the Soviet Union as monolithic and relentlessly controlled by centralized state agencies. While these judgments have an element of truth, they also reflect serious misperceptions; we need to realize that internal discussion, especially of issues involving large-scale social reorganization, does in fact take place and that there is a well-developed "bureaucratic politics" in the USSR.

Some of the groups with an interest in the higher education reform are similar to what we might find in other countries, and some are different. Students want an education, a satisfying job, and the chance for future advancement. Academics want to carry on research, teach students, and pass on their own disciplinary expertise. Industrial managers want to hire appropriately educated workers. These aspects of Soviet life would raise no eyebrows in the West.

But there are major actors and influences in the USSR that we do not see paralleled in this country. The Communist Party, for example, sets direction for discussion of issues and still determines the breadth of what may be debated, while most citizens probably accept this aspect of their lives. But if the Party still guides with a firm hand, it also realizes now that it cannot dictate absolute compliance without involving, encouraging,

or motivating its citizens. This is particularly true for higher education, where faculty by temperament and training are likely to be more outspoken and opinionated than other sectors of the populace.

Also distinctive to the Soviet setting are a strong tradition of intellectual discourse with regard to social questions and a heritage of prestige attached to those who have attained a higher education, lending a distinctly high and serious tone to the discussion of postsecondary education reform in the USSR.

The Soviet attitude toward the West is another peculiar aspect of the reform effort. The assumption that high technology will drive the future economic development of the nation, for example, is a newer idea in the USSR than it is elsewhere, and the fact that the USSR lags behind many other nations in the development and application of computer technology is at once an energizer to action and a caution for many in Soviet academic life. Such questions as whether new technology should be imported or developed locally are important for Soviet scholars, and they impart a distinctive tone to the ways the higher education reform is considered.

The specific setting of Soviet higher education. Also important for us to bear in mind are the particular features of the system of higher education as is has developed in the USSR. That system has, for example, always been very vocationally oriented; the notion of the "liberal arts graduate" is simply foreign to Soviet experience and practice. Production of "specialists for the national economy" has been the target for years.

This situation has led to the fragmented and overspecialized nature of the system as described above--the power of individual ministries to set the curriculum for their own graduates has resulted in a system very centralized but at the same time very disorganized; rational planning has become virtually impossible (and the assumption that one can plan rationally from

the center is another distinctive Soviet trait!). The reform would replace the fragmented control with more central direction from the Ministry of Higher and Specialized Secondary Education on general requirements, but also with more local freedom to determine curriculum and other matters. This is perhaps the most genuinely significant aspect of the reform for university administrators and for the planning of higher education as a whole.

Indeed, the forces in Soviet universities and institutes resisting change are quite formidable. Rectors accustomed to a particular set of bureaucratic rules and procedures may now find many of them turned dramatically around; planning practices will be significantly changed, and this may generate some resistance and foot-dragging. Academics may not want to participate in R & D work with industry to the extent that the reform urges, and those in industry have many of the same suspicions about the "ivory tower" nature of academic life that are found elsewhere. Students may also resist the increased vocationalism encouraged by the reform, and their parents may worry over their children's chances of getting a higher education at all when the new limits on enrollment are put into place.

A further factor complicating the reform effort is an apparent popular turn away from the unequivocal enthusiasm for science and technology that the USSR witnessed between about 1920 and 1960. While science and technology are still officially seen to offer the best hope for future economic and social development, Western observers have recently called attention to such social and institutional traits as the Soviet aversion to risk-taking, difficulties in diffusing innovations rapidly and effectively, and a tendency to focus on theory at the expense of application (Balzer, 1985). There is also a disturbing new cultural factor--a retreat into ascientific mysticism, popular personal psychology, and reverence for the past (Graham, 1987).

These Soviet trends diverge somewhat from the pattern observed in American cultural life: an initial uncritical praise for science and technology (1950s-1960s), a radical rejection (1970s), followed by a more mature and balanced recognition of the place of science in society, combined with a perception of technology's limitations and the imperfections of a reductionist world view in the 1980s (Yankelovich, 1984). Perhaps the Soviet Union is just now entering the phase this country passed through in the 1970s, but if that is the case, there is no guarantee that the next stage will parallel our own.

A comparative perspective on higher education reform and national science policy. On the surface, there appear to be many parallels between the Soviet impetus to reform higher education and changes that have been proposed here to improve the conduct of scientific research and technological development (on the latter, for example, see Bloch, 1986): in both countries, the infrastructure of the nation's universities and research laboratories is to be strengthened and rebuilt; significant new infusions of funding for research and development must come from industry as well as from government; the role of government in directing and administering the scientific enterprise must become more central but also less burdensome; and the quality of specialist training provided by higher education must improve.

But if there is a general concern that government must become more proactive in encouraging links between universities and the economy, there are also important differences between the two systems in how such connections will be generated in practice. Factors working in favor of the Soviet effort include these: the ability centrally to encourage capital flows from industry to universities (though this is much more limited than a naive view of Soviet industry would suggest); strong social and cultural

traditions supporting central definition of national research policy; a less-developed popular lobby opposing certain research and development projects (cf. the environmental movement in this country, although there are nascent Soviet groups doing this); less concern over the dissemination of what would here be regarded as proprietary information; and a moderately high degree of support for the reform effort on the parts of scientists and engineers (though the views of the general populace are likely less sanguine, due to the proposed restrictions in access to higher education).

Working against the Soviet reform efforts will be a host of institutional and cultural factors: Soviet institutions of higher education lack a tradition of cooperation with industry; they will need to overcome long-established patterns of bureaucratic inertia and isolation from the economy; and the economy from which must come much of the impetus (and funding) to implement the reform is already severely taxed. To add a two- to four-fold increase in research and development activity may require larger infusions of capital than industry can conveniently generate (especially in a time when there are strong competing reform demands to increase production, modernize facilities, and improve the quality of output).

Administering these expanded research and development activities may also be more than the higher education bureaucracy can easily handle. As some Western commentators have noted, economic growth does not follow automatically from technological development--the social and political context in which such changes take place, as well as the abilities to communicate, diffuse, and use the products of science effectively, all may ultimately be more crucial to economic growth than technological change per se (Shapiro, 1986).

What, then, is the likelihood that the USSR will succeed in its attempt to reform the higher education system and the contributions it makes to

economic growth through science and technology? At the initial phase, there may be considerable activity, but its consolidation over time will be the critical test. More problematic for the Soviet Union are the long-term prospects--the attempts to change popular attitudes, cultural traditions, and established social patterns. Modifying these, which Communist Part General Secretary Mikhail Gorbachev is currently trying to do with some urgency, is a much more complex and difficult matter.

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